

wide in the middle. Disconnected fragments show that the base diminishes insensibly to a lengthened petiole, as in the *G. Browniana*, and that the apex is elliptical and pointed.

Very abundant in the gray shale of Wollongong; not uncommon in the hard siliceous schists of Arowa, N. S. Wales.

*Pecopteris* ? *tenuifolia* (M'Coy). Pl. IX. fig. 6.

*Sp. Char.* Bipinnatifid (?); pinnules and rachis very slender, each about half a line wide; pinnules very long, oblique, linear, apparently simply united to the rachis by their entire base, one very strong midrib running throughout; secondary nerves unknown.

If this be truly a *Pecopteris*, it is distinct from all others by its very narrow, linear leaflets. The only plant I have seen at all resembling it is the *Zamites obtusifolius* from the shale of the oolitic coal-fields of Blackheath, Richmond, United States, exhibited some weeks since by Mr. Lyell to the Geological Society. The specimens alluded to of this latter plant seem imperfectly preserved, but still show, on some portions of the pinnules, a neuration running parallel with a strong midrib. This great midrib seems to me incompatible with *Zamites*, so that although I point to the resemblance between the American and Australian plants, I prefer placing the latter provisionally in *Pecopteris*, as I have seen no trace in my imperfectly preserved specimens of a parallel neuration; and even if it should hereafter be found to exist, I conceive it would be necessary to form a new genus, intermediate in form, neuration, and (I think) mode of attachment of the pinnules to the rachis, between *Zamites* and *Pecopteris*, for the reception of those two plants.

One specimen has occurred in the fine sandstone of Clark's Hill, N. S. Wales.

Class ENDOGENS. (*Al. Palmales.*)

Ord. PALMACEÆ.

*Zeugophyllites elongatus* (Mor.).

Common in the shales of Mulubimba, N. S. Wales.

Class EXOGENS. (*Al. Amentales.*)

Ord. CASUARINACEÆ (?).

*Phyllothea* (Br.).

M. Brongniart, in his 'Prodrome,' finds this genus for a single species, the *P. australis*, of which he mentions having a large number of well-preserved specimens, which he describes as "des tiges simples, droites, articulées, entourées de distance

en distance par des gâines appliquées contre cette tige, comme dans les *Equisetum*, mais terminées par de longues feuilles linéaires, qui remplacent les dents courtes des gâines des Prêles. Ces feuilles sont, ou dressées, ou plus souvent étalées, et même réfléchies; elles sont linéaires, aiguës, sans nervure distincte, au moins deux fois plus longues que la gâine. Les gâines elles-mêmes présentent de légers sillons longitudinaux, qui disparaissent vers la base, et qui semblent correspondre à l'intervalle des feuilles, comme les sillons des gâines des *Equisetum* correspondent à l'intervalle des dents. La tige, dans l'espace qui sépare les gâines, paroît lisse; mais sur des fragmens de tiges un peu plus grosses, qui appartiennent probablement à des individus plus âgés, de la même plante, on voit des stries régulières, presque comme sur les Calamites." While, on the other hand, Messrs. Lindley and Hutton in their 'Fossil Flora' (article *Hippurites gigantea*) state, that having examined specimens communicated by Dr. Buckland (from whom also Brongniart received his), they found Brongniart's description inaccurate, and that the leaves, instead of springing from the edge of the sheath, arise immediately from the stem, and having in addition to the whorl of distinct leaves "a sheath originating within them and closely embracing the stem, to which it gives the appearance of the barren shoots of an *Equisetum*, with its whorls of slender branches on the outside of a toothed sheath." Unger, in his 'Chloris Protogæa,' referring both to Brongniart and Lindley and Hutton, defines the plant as "Caulis simplex, rectus, articulatus vaginatusque. Folia verticillata linearia, enervia contracta v. expansa, vaginas articulorum strictas circumdantia." Mr. Morris, I believe the latest writer on this plant, closely follows Brongniart in his observations on its structure.

I have now stated what I believe to be all the published information regarding this very interesting form, and as it has not been hitherto figured, and the published accounts are contradictory among themselves, and none of them as I find strictly applicable to the plant, it may be interesting to detail some of the observations I have been enabled to make on those specimens which have come under my notice.

I find in the whitish clay beds of Mulubimba a profusion of plants having cylindrical jointed stems, the joints surrounded by sheaths, and the free edge of each sheath terminating in a whorl of long, linear leaves. Here we have all the essential characters of *Phyllothea*, but beyond this there is no agreement with the descriptions of those few botanists who have seen the plant. And here I may be permitted to state, that from the number of specimens which I have examined with great care, there remains not a doubt on my mind of the accuracy of M. Brongniart's view of

the relation of the whorls of leaves to the sheaths : I have traced them distinctly in every instance as arising from the free edge of the sheath, and lying either straight, inclining obliquely outwards, or, as is most commonly the case, completely reflexed, as I have represented in the drawing Pl. XI. fig. 2 : and their occurrence in this position may have deceived Messrs. Lindley and Hutton as to their real connexion with the sheaths ; for when the long slender leaves are completely reflexed and pressed in a reversed position against the sheaths, broken specimens may easily have their inferior mistaken for their superior extremities ; and if when in this position the leaves be supposed to point upwards, they will really have the appearance of originating as an independent whorl of leaves *outside of the base of the sheath*, as described in the 'Fossil Flora.' This double arrangement would be so anomalous, that it is the more important to have the means of ascertaining the true relation of those parts in accordance with Brongniart's original view.

Brongniart describes the stem as smooth, and I find the specimens before me apparently divisible into two groups, one having the stem smooth, the other having it coarsely sulcated longitudinally, as in *Calamites*. All the botanists alluded to agree in describing the stem of *Phyllothea australis* as simple ;—*all the sulcated stems* I have seen are simple, but a number of the smooth or slightly striated stems are distinctly branched, and in a manner quite distinct from *Equisetum*. In *Equisetum*, if we view with most botanists the sheaths as produced by the mere lateral union of the leaves, and thus representing the foliage of other plants, we have the extraordinary character of the branches arising, not as axillary buds originating immediately above and within the base of the leaves, but originating *below* the joints and external to the sheaths. This is not the case with the fossil before us, in which the branches originate directly over the joints, and are therefore within and axillary to the sheaths, which may thus, with their appendages, be considered as true leaves, and having the same relation to the branches as in ordinary plants. This character is of such importance, that the resemblance of *Phyllothea* to *Equisetum* is proved by it to be of the most trifling nature, and that there can be no real affinity between them. On the other hand, when compared with *Casuarina*, the affinity seems to me to be exceedingly strong, although botanists have not, I believe, hitherto so considered it. The *Casuarinæ* are exogenous weeping trees, with slender cylindrical branches, their shoots regularly jointed, longitudinally sulcated, and surrounded at the joints with toothed sheaths as in *Equisetum* ; while the branches originate either in a verticillate or irregular manner immediately above the joints and within the sheaths, showing a perfect agreement with